CPC COOPERATIVE PATENT CLASSIFICATION

H02P CONTROL OR REGULATION OF ELECTRIC MOTORS, GENERATORS, OR DYNAMO-ELECTRIC CONVERTERS; CONTROLLING TRANSFORMERS, REACTORS OR CHOKE COILS ({ specially adapted for electrically propelled vehicles B60L }; structure of the starter, brake, or other control devices, see the relevant subclasses, e.g. mechanical brake F16D , mechanical speed regulator G05D , variable resistor H01C , starter switch H01H ; systems for regulating electric or magnetic variables using transformers, reactors or choke coils G05F ; arrangements structurally associated with motors, generators, dynamo-electric converters, transformers, reactors or choke coils, see the relevant subclasses, e.g. H01F , H02K ; connection or control of one generator, transformer, reactor, choke coil, or dynamo-electric converter with regard to conjoint operation with similar or other source of supply H02J ; control or regulation of static converters H02M)

NOTE

This subclass covers arrangements for starting, regulating, electronically commutating, braking, or otherwise controlling motors, generators, dynamo-electric converters, clutches, brakes, gears, transformers, reactors or choke coils, of the types classified in the relevant subclasses, e.g. H01F , H02K .

This subclass does not cover similar arrangements for the apparatus of the types classified in subclass H02N , which arrangements are covered by that subclass.

In this subclass, the following terms or expressions are used with the meanings indicated:

- "control" means influencing a variable in any way, e.g. changing its direction or its value (including changing it to or from zero), maintaining it constant, limiting its range of variation;
- "regulation" means maintaining a variable at a desired value, or within a desired range of values, by comparison of the actual value with the desired value.

H02P 1/00 Arrangements for starting electric motors or dynamo-electric converters (starting of synchronous motors with electronic commutators except reluctance motors, H02P 6/20, H02P 6/22; starting dynamo-electric motors rotating step by step H02P 8/04; vector control H02P 21/00)

H02P 1/02 . Details

H02P 1/021 . . { Protection against "no voltage condition" }

H02P 1/022 . . { Security devices, e.g. correct phase sequencing }

H02P 1/023 . . . { Protection against sparking of contacts or sticking together }

H02P 1/024 . . . { Protection against simultaneous starting by two starting devices }

H02P 1/025 . . . { Protection against starting if starting resistor is not at zero position }

H02P 1/026 . . . { Means for delayed starting }

H02P 1/027 . . { Special design of starting resistor }

H02P 1/028 . . { wherein the motor voltage is increased at low speed, to start or restart high

inertia loads }

H02P 1/029 . . { Restarting, e.g. after power failure }

H02P 1/04 . . Means for controlling progress of starting sequence in dependence upon time or upon current, speed, or other motor parameter

H02P 1/06 . . . Manually-operated multi-position starters

H02P 1/08 . . . Manually-operated on/off switch controlling power-operated multi-position switch or impedances for starting a motor

H02P 1/10 . . . Manually-operated on/off switch controlling relays or contactors operating sequentially for starting a motor (sequence determined by power-operated multi-position switch H02P 1/08)

H02P 1/12 . . . Switching devices centrifugally operated by the motor

H02P 1/14 . . . Pressure-sensitive resistors centrifugally operated by the motor

H02P 1/16 . for starting dynamo-electric motors or dynamo-electric converters

H02P 1/163 . . { for starting an individual reluctance motor }

H02P 1/166 . . { Driving load with high inertia }

H02P 1/18 . . for starting an individual dc motor

H02P 1/20 . . . by progressive reduction of resistance in series with armature winding

H02P 1/22 . . . in either direction of rotation

H02P 1/24 . . for starting an individual ac commutator motor (starting of ac/dc commutator motors H02P 1/18)

NOTE

Group H02P 1/029 takes precedence over groups H02P 1/26 to H02P 1/54

H02P 1/26 . . for starting an individual polyphase induction motor

H02P 1/265 . . . { Means for starting or running a triphase motor on a single phase supply }

H02P 1/28 . . . by progressive increase of voltage applied to primary circuit of motor

H02P 1/30 . . . by progressive increase of frequency of supply to primary circuit of motor

H02P 1/32 . . . by star-delta switching

H02P 1/34 . . . by progressive reduction of impedance in secondary circuit

H02P 1/36 . . . . the impedance being a liquid resistance

H02P 1/38 . . . by pole-changing

H02P 1/40 . . . in either direction of rotation

H02P 1/42 . . for starting an individual single-phase induction motor { (H02P 27/04 takes precedence) }

H02P 1/423 . . . { by using means to limit the current in the main winding }

H02P 1/426 . . . { by using a specially adapted frequency converter }

H02P 1/44 . . . by phase-splitting with a capacitor

H02P 1/445 . . . . { by using additional capacitors switched at start up }

H02P 1/46 . . for starting an individual synchronous motor { (H02P 27/04 takes precedence) }

H02P 1/465 . . . { for starting an individual single-phase synchronous motor }

H02P 1/48 . . . by pole-changing

H02P 1/50 . . . by changing over from asynchronous to synchronous operation (H02P 1/48 takes precedence)

H02P 1/52 . . . by progressive increase of frequency of supply to motor

H02P 1/54 . . for starting two or more dynamo-electric motors

H02P 1/56 . . . simultaneously

H02P 1/58 . . . sequentially

H02P 3/00 **Arrangements for stopping or slowing electric motors, generators, or dynamo-electric converters** (stopping of synchronous motors with electronic commutators except reluctance motors, H02P 6/24; stopping dynamo-elecric motors rotating step by step H02P 8/24; vector controlH02P 21/00)

H02P 3/02 . Details

H02P 3/025 . . { holding the rotor in a fixed position after deceleration }

H02P 3/04 . . Means for stopping or slowing by a separate brake, e.g. friction brake, eddy-current brake (brakes F16D , H02K 49/00)

H02P 3/06 . for stopping or slowing an individual dynamo-electric motor or dynamo-electric converter

H02P 3/065 . . { for stopping or slowing a reluctance motor }

H02P 3/08 . . for stopping or slowing a dc motor

H02P 3/10 . . . by reversal of supply connections

H02P 3/12 . . . by short-circuit or resistive braking

H02P 3/14 . . . by regenerative braking

H02P 3/16 . . . by combined electrical and mechanical braking

H02P 3/18 . . for stopping or slowing an ac motor

H02P 3/20 . . . by reversal of phase sequence of connections to the motor

H02P 3/22 . . . by short-circuit or resistive braking

H02P 3/24 . . . by applying dc to the motor

H02P 3/26 . . . by combined electrical and mechanical braking

H02P 4/00 **Arrangements specially adapted for regulating or controlling the speed or torque of electric motors that can be connected to two or more different voltage or current supplies** (starting H02P 1/00; stopping or slowing H02P 3/00; vector control H02P 21/00)

H02P 5/00 **Arrangements specially adapted for regulating or controlling the speed or torque of two or more electric motors** (starting H02P 1/00; stopping or slowing H02P 3/00; { synchronous motors or other dynamo-electric motors with electronic commutators in dependence on the rotor position H02P 6/00; motors rotating step by step H02P 8/00; } vector control H02P 21/00)

H02P 5/46 . for speed regulation of two or more dynamo-electric motors in relation to one another

H02P 5/48 . . by comparing mechanical values representing the speeds

H02P 5/483 . . . { using differential movement }

H02P 5/486 . . . { by intermittently closing or opening electrical contacts }

H02P 5/50 . . by comparing electrical values representing the speeds

H02P 5/503 . . . { using equalising lines }

H02P 5/506 . . . { Direct ratio control }

H02P 5/52 . . additionally providing control of relative angular displacement { of relative angular position or phase }

H02P 5/523 . . . { Speed and position comparison by mechanical means }

H02P 5/526 . . . { Speed and position comparison by electrical means }

H02P 5/60 . controlling combinations of dc and ac dynamo-electric motors (H02P 5/46 takes precedence)

H02P 5/68 . controlling two or more dc dynamo-electric motors (H02P 5/46, H02P 5/60 take precedence)

H02P 5/685 . . electrically connected in series, i.e. carrying the same current

H02P 5/69 . . mechanically coupled by gearing

H02P 5/695 . . . Differential gearing

H02P 5/74 . controlling two or more ac dynamo-electric motors (H02P 5/46, H02P 5/60 take precedence)

H02P 5/747 . . mechanically coupled by gearing

H02P 5/753 . . . Differential gearing

H02P 6/00 **Arrangements for controlling synchronous motors or other dynamo-electric motors with electronic commutators in dependence on the rotor position; Electronic commutators therefor** (stepping motors H02P 8/00; vector control H02P 21/00; reluctance motors H02P 25/08)

NOTE

Groups H02P 6/006 and H02P 6/008 take precedence over groups H02P 6/001 to H02P 6/005 and H02P 6/04 to H02P 6/24

H02P 6/001 . { Details, e.g. modelling, simulation, comparisons, control principles in general }

H02P 6/002 . { Arrangements for controlling current (H02P 6/10 takes precedence) }

H02P 6/003 . { Controlling the direction of rotation }

H02P 6/005 . { Arrangements for controlling doubly fed motors }

H02P 6/006 . { Controlling linear motors }

H02P 6/007 . { wherein the position is detected using the ripple of the current caused by the commutation }

H02P 6/008 . { Controlling single phase motors }

H02P 6/04 . Arrangements for controlling or regulating speed or torque of more than one motor

H02P 6/06 . Arrangements for speed regulation of a single motor wherein the motor speed is measured and compared with a given physical value so as to adjust the motor speed

H02P 6/08 . Arrangements for controlling the speed or torque of a single motor { (H02P 6/002

takes precedence) }

H02P 6/085 . . { in a bridge configuration }

H02P 6/10 . . providing reduced torque ripple; controlling torque ripple

H02P 6/12 . Monitoring commutation; Providing indication of commutation failure

H02P 6/14 . Electronic commutators

H02P 6/142 . . { Changing commutation time }

H02P 6/145 . . . { wherein the commutation is advanced from position signals phase in function of the speed }

H02P 6/147 . . . { wherein the commutation is function of electro magnetic force [EMF] }

H02P 6/16 . . Circuit arrangements for detecting position (structural arrangement of position sensors H02K 29/06)

H02P 6/165 . . . { and generating speed information }

H02P 6/18 . . . without separate position detecting elements, e.g. using back-emf in windings { (H02P 6/165 takes precedence) }

H02P 6/181 . . . . { using different methods depending on the speed }

H02P 6/182 . . . . { using back-emf in windings }

H02P 6/183 . . . . { using an injected high frequency signal }

H02P 6/185 . . . . { using pulse excitation }

H02P 6/186 . . . . { using difference of inductance or reluctance between the phases }

H02P 6/187 . . . . { using the star point voltage }

H02P 6/188 . . . . { using the voltage difference between the windings (H02P 6/182 takes precedence) }

H02P 6/20 . Arrangements for starting (H02P 6/08, H02P 6/22 take precedence)

H02P 6/205 . . { Open loop start }

H02P 6/22 . Arrangements for starting in a selected direction of rotation

H02P 6/24 . Arrangements for stopping

H02P 7/00 **Arrangements for regulating or controlling the speed or torque of electric DC motors** (starting H02P 1/00; stopping or slowing H02P 3/00; { synchronous motors or other dynamo-electric motors with electronic commutators in dependence on the rotor position H02P 6/00; motors rotating step by step H02P 8/00; } vector control H02P 21/00)

H02P 7/0038 . { Controlling the direction of rotation of DC motors }

H02P 7/0044 . . { by means of a H-bridge circuit }

H02P 7/0066 . . { by means of electronic switching }

H02P 7/0094 . { wherein the position is detected using the ripple of the current caused by the commutator }

H02P 7/06 . for regulating or controlling an individual dc dynamo-electric motor by varying field or armature current

H02P 7/063 .. { using centrifugal devices, e.g. switch, resistor }

H02P 7/066 .. { using a periodic interrupter, e.g. Tirrill regulator }

H02P 7/08 .. by manual control without auxiliary power

H02P 7/10 ... of motor field only

H02P 7/12 .... Switching field from series to shunt excitation or vice versa

H02P 7/14 ... of voltage applied to the armature with or without control of field { Ward-Leonard }

H02P 7/18 .. by master control with auxiliary power

H02P 7/20 ... using multi-position switch, e.g. drum, controlling motor circuit by means of relays (H02P 7/24, H02P 7/30 take precedence)

H02P 7/22 ... using multi-position switch, e.g. drum, controlling motor circuit by means of pilot-motor-operated multi-position switch or pilot-motor-operated variable resistance (H02P 7/24, H02P 7/30 take precedence)

H02P 7/24 ... using discharge tubes or semiconductor devices

H02P 7/245 .... { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 7/26 .... using discharge tubes

H02P 7/265 ..... { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 7/28 .... using semiconductor devices

NOTE

Group H02P 7/281 takes precedence over groups H02P 7/282 to H02P 7/298

H02P 7/2805 ..... { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 7/281 ..... { the DC-motor being operated in the four quadrants }

H02P 7/2815 ..... { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

NOTE

Groups H02P 7/2815takes precedence over groups H02P 7/28R

H02P 7/282 ..... controlling field supply only

H02P 7/2825 ..... { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 7/285 ..... controlling armature supply only

H02P 7/2855 ..... { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 7/288 ..... using variable impedance

H02P 7/2885 ..... { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 7/29 ..... using pulse modulation

H02P 7/2906 ..... { with on-off control between two set points }

H02P 7/2913 ..... { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 7/292 . . . . . using static converters, e.g. ac to dc

H02P 7/2925 . . . . . { using phase control (H02P 7/295 takes precedence) }

H02P 7/295 . . . . . of the kind having a thyristor or the like in series with the power supply and the motor

H02P 7/298 . . . . . controlling armature and field supply

H02P 7/2985 . . . . . { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 7/30 . . . using magnetic devices with controllable degree of saturation, i.e. transductors

H02P 7/305 . . . . { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 7/32 . . . using armature-reaction-excited machines, e.g. metadyne, amplidyne, rototrol

H02P 7/325 . . . . { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 7/34 . . . using Ward-Leonard arrangements

H02P 7/343 . . . . { in which only the generator field is controlled }

H02P 7/346 . . . . { in which both generator and motor fields are controlled }

H02P 7/72 . . . for changing between series and parallel connections of motors

H02P 8/00 **Arrangements for controlling dynamo-electric motors of the kind having motors rotating step by step** (vector control H02P 21/00)

H02P 8/005 . { of linear motors }

H02P 8/02 . specially adapted for single-phase or bi-pole stepper motors, e.g. watch-motors, clock-motors

NOTE

Groups H02P 8/005 and H02P 8/02 take precedence over groups H02P 8/04 to H02P 8/42

H02P 8/04 . Arrangements for starting

H02P 8/06 . . in selected direction of rotation

H02P 8/08 . . Determining position before starting

H02P 8/10 . . Shaping pulses for starting; Boosting current during starting

H02P 8/12 . Control or stabilisation of current

H02P 8/14 . Arrangements for controlling speed or speed and torque (H02P 8/12, H02P 8/22 take precedence)

H02P 8/16 . . Reducing energy dissipated or supplied

H02P 8/165 . . . { using two level supply voltage }

H02P 8/18 . . Shaping of pulses, e.g. to reduce torque ripple

H02P 8/20 . . characterised by bidirectional operation

H02P 8/22 . Control of step size; Intermediate stepping, e.g. micro-stepping

H02P 8/24 . Arrangements for stopping (H02P 8/32 takes precedence)

H02P 8/26 . . Memorising final pulse when stopping

H02P 8/28 . . Disconnecting power source when stopping

H02P 8/30 . . Holding position when stopped

H02P 8/32 . Reducing overshoot or oscillation, e.g. damping

H02P 8/34 . Monitoring operation (H02P 8/36 takes precedence)

H02P 8/36 . Protection against faults, e.g. against overheating, step-out; Indicating faults (emergency protective arrangements with automatic interruption of supply H02H 7/08)

H02P 8/38 . . the fault being step-out

H02P 8/40 . Special adaptations for controlling two or more stepping motors

H02P 8/42 . characterised by non-stepper motors being operated step by step

H02P 9/00 **Arrangements for controlling electric generators for the purpose of obtaining a desired output** (Ward-Leonard arrangements H02P 7/34; vector control H02P 21/00; feeding a network by two or more generators H02J ; for charging batteries H02J 7/14)

H02P 9/006 . { Means for protecting the generator by using control (H02H 7/06 takes precedence; control effected upon generator excitation circuit to reduce harmful effects of overloads or transients H02P 9/10) }

H02P 9/007 . { Control circuits for doubly fed generators }

H02P 9/008 . { wherein the generator is controlled by the requirements of the prime mover }

H02P 9/009 . { Circuit arrangements for detecting rotor position }

H02P 9/02 . Details

H02P 9/04 . Control effected upon non-electric prime mover and dependent upon electric output value of the generator (effecting control of the prime mover in general, see the relevant class for such prime mover)

H02P 9/06 . Control effected upon clutch or other mechanical power transmission means and dependent upon electric output value of the generator (effecting control of the power transmission means, see the relevant class for such means)

H02P 9/08 . Control of generator circuit during starting or stopping of driving means, e.g. for initiating excitation

H02P 9/10 . Control effected upon generator excitation circuit to reduce harmful effects of overloads or transients, e.g. sudden application of load, sudden removal of load, sudden change of load

H02P 9/102 . . { for limiting effects of transients }

H02P 9/105 . . { for increasing the stability }

H02P 9/107 . . { for limiting effects of overloads }

H02P 9/12 . . for demagnetising; for reducing effects of remanence; for preventing pole reversal

H02P 9/123 . . . { for demagnetising; for reducing effects of remanence }

H02P 9/126 . . . { for preventing pole reversal }

H02P 9/14 . by variation of field (H02P 9/08, H02P 9/10 take precedence)

H02P 9/16 . . due to variation of ohmic resistance in field circuit, using resistances switched in or out of circuit step by step

H02P 9/18 . . . the switching being caused by a servomotor, measuring instrument, or relay

H02P 9/20 . . due to variation of continuously-variable ohmic resistance

H02P 9/22 . . . comprising carbon pile resistance

H02P 9/24 . . due to variation of make-to-break ratio of intermittently-operating contacts, e.g. using Tirrill regulator

H02P 9/26 . . using discharge tubes or semiconductor devices (H02P 9/34 takes precedence)

H02P 9/28 . . . using discharge tubes

H02P 9/30 . . . using semiconductor devices

H02P 9/302 . . . . { Brushless excitation }

H02P 9/305 . . . . { controlling voltage (H02P 9/302 takes precedence) }

H02P 9/307 . . . . . { more than one voltage output }

H02P 9/32 . . using magnetic devices with controllable degree of saturation (H02P 9/34 takes precedence)

H02P 9/34 . . using magnetic devices with controllable degree of saturation in combination with controlled discharge tube or controlled semiconductor device

H02P 9/36 . . using armature-reaction-excited machines

H02P 9/38 . . Self-excitation by current derived from rectification of both output voltage and output current of generator

H02P 9/40 . by variation of reluctance of magnetic circuit of generator

H02P 9/42 . to obtain desired frequency without varying speed of the generator

H02P 9/44 . Control of frequency and voltage in predetermined relation, e.g. constant ratio

H02P 9/46 . Control of asynchronous generator by variation of capacitor

H02P 9/48 . Arrangements for obtaining a constant output value at varying speed of the generator, e.g. on vehicle (H02P 9/04 to H02P 9/46 take precedence)

H02P 11/00 **Arrangements for controlling dynamo-electric converters** (starting H02P 1/00; stopping or slowing H02P 3/00; vector control H02P 21/00; feeding a network in conjunction with a generator or another converter H02J)

H02P 11/04 . for controlling dynamo-electric converters having a dc output

H02P 11/06 . for controlling dynamo-electric converters having an ac output

H02P 13/00 **Arrangements for controlling transformers, reactors or choke coils, for the purpose of obtaining a desired output** (regulation systems using transformers, reactors or choke coils G05F ; transformers H01F ; feeding a network in conjunction with a generator or a converter H02J ; control or regulation of converters H02M)

H02P 13/06 . by tap-changing; by rearranging interconnections of windings

H02P 13/08 . by sliding current collector along winding

H02P 13/10 . by moving core, coil winding, or shield, e.g. by induction regulator

H02P 13/12 . by varying magnetic bias

H02P 15/00 **Arrangements for controlling dynamo-electric brakes or clutches** (controlling speed of dynamo-electric motors by means of a separate brake H02P 29/04, vector control H02P 21/00) { see provisionally also H02K 49/00 and H02P 29/0022 }

WARNING

Not complete, see also H02K 49/00 and H02P 29/0022

H02P 15/02 . Conjoint control of brakes and clutches

H02P 17/00 **Arrangements for controlling dynamo-electric gears** (vector control H02P 21/00)

H02P 21/00 **Arrangements or methods for the control of electric machines by vector control, e.g. by control of field orientation**

NOTE

1. Groups H02P 21/06 to H02P 21/12 cover vector control arrangements or methods involving the use of rotor position or speed sensors.
2. Vector control arrangements or methods not involving the use of rotor position or speed sensors are classified in groups H02P 21/0039 and subgroups

When classifying in this group, it is desirable to also classify in groups 25/00 to 27/00 if the kind of AC motor, structural details, or the kind of supply voltage are of interest.

H02P 21/0003 . { Control strategies in general, e.g. linear type e.g. P, PI, PID, using robust control }

H02P 21/0007 . . { using sliding mode control }

H02P 21/001 . . { using fuzzy control }

H02P 21/0014 . . { using neural networks }

H02P 21/0017 . . { Model reference adaptation, e.g. MRAS or MRAC, useful for control or parameter estimation }

H02P 21/0021 . . { using different modes of control depending on a parameter, e.g. the speed }

H02P 21/0025 . . { implementing a off line learning phase to determine and store useful data for on-line control }

H02P 21/0032 . { Arrangements for starting }

H02P 21/0035 . { Current control }

H02P 21/0039 . { not involving the use of rotor position or speed sensors }

H02P 21/0042 . . { Rotor flux based control }

H02P 21/0046 . . { Stator flux based control }

H02P 21/005 . . . { Direct torque control (DTC) or field acceleration method (FAM) }

H02P 21/0053 . . { Determining the initial rotor position (arrangements for starting H02P 21/0032; position detection in general H02P 6/16-H02P 6/185) }

H02P 21/0085 . { specially adapted for high speeds, e.g. above nominal speed }

H02P 21/0089 . . { using field weakening }

H02P 21/0092 . { Arrangements for braking or slowing; Four quadrants control }

H02P 21/0096 . { Vector control arrangements or methods not otherwise provided for in H02P 21/00-H02P 21/148 }

H02P 21/02 . specially adapted for optimising the efficiency at low load

H02P 21/04 . specially adapted for very low speeds { (arrangements for starting H02P 21/0032; determining the initial rotor position H02P 21/0053) }

H02P 21/05 . specially adapted for damping motor oscillations, e.g. for reducing hunting

H02P 21/06 . Rotor flux based control { involving the use of rotor position or speed sensor }

H02P 21/08 . . Indirect field-oriented control, e.g. field phase angle calculation based on rotor voltage equation by adding slip frequency and speed proportional frequency; { Rotor flux feed-forward control }

H02P 21/085 . . . { adding slip frequency and speed proportional frequency }

H02P 21/10 . . Direct field-oriented control; { Rotor flux feed-back control }

H02P 21/12 . Stator flux based control, { involving the use of rotor position or speed sensor }

H02P 21/13 . Observer control, e.g. using Luenberger observers or Kalman filters

H02P 21/14 . Estimation or adaptation of machine parameters, e.g. rotor time constant, flux, speed, current or voltage

H02P 21/141 . . { Flux estimation }

H02P 21/143 . . { Inertia or moment of inertia estimation }

H02P 21/145 . . { constants estimation, e.g. of the rotor time constant }

H02P 21/146 . . { Position or speed estimation }

H02P 21/148 . . { Torque estimation }

H02P 23/00 **Arrangements or methods for the control of AC motors characterised by a control method other than vector control** (starting H02P 1/00; stopping or slowing H02P 3/00; of two or more motors H02P 5/00; of synchronous motors with electronic commutators H02P 6/00; of DC motors H02P 7/00; of stepping motors H02P 8/00)

NOTE

When classifying in this group, it is desirable to also classify in groups 25/00 to 27/00 if the kind of AC motor, structural details, or the kind of supply voltage are of interest.

H02P 23/0004 . { Control strategies in general, e.g. linear type e.g. P, PI, PID, using robust control (control strategies related to the motor H02P 23/0036) }

H02P 23/0009 . . { using sliding mode control }

H02P 23/0013 . . { using fuzzy control }

H02P 23/0018 . . { using neural networks }

H02P 23/0022 . . { Model reference adaptation, e.g. MRAS or MRAC, useful for control or parameter estimation }

H02P 23/0027 . . { using different modes of control depending on a parameter, e.g. the speed }

H02P 23/0031 . . { implementing a off line learning phase to determine and store useful data for on-line control }

H02P 23/0036 . { Control strategies related to the functioning of the motor }

H02P 23/004 . . { Direct torque control (DTC); Field acceleration method (FAM) }

H02P 23/0045 . { Control of angular speed of one shaft by controlling the prime mover (H02P 23/005 takes precedence) }

H02P 23/005 . { Control of angular speed together with angular position or phase }

H02P 23/0054 . . { of one shaft without controlling the prime mover }

H02P 23/0059 . . { of one shaft by controlling the prime mover }

H02P 23/0063 . { Control of acceleration or deceleration }

H02P 23/0068 . { Digital speed control using a reference oscillator, a speed proportional pulse rate feedback and a digital comparator }

H02P 23/0072 . { Controlling the direction, e.g. clockwise - counterclockwise }

H02P 23/0077 . { Characterised by the use of a particular software algorithm }

H02P 23/0081 . { Power Factor Control }

H02P 23/0086 . { specially adapted for high speeds, e.g. above nominal speed }

H02P 23/009 . . { using field weakening }

H02P 23/0095 . { controlled by the switch frequency of the switches connected to a DC supply and the motor phases }

H02P 23/02 . specially adapted for optimising the efficiency at low load

H02P 23/03 . specially adapted for very low speeds

H02P 23/04 . specially adapted for damping motor oscillations, e.g. for reducing hunting

H02P 23/06 . Controlling the motor in four quadrants

H02P 23/065 . . { Polyphase or monophase asynchronous induction motors }

H02P 23/08 . Controlling based on slip frequency, e.g. adding slip frequency and speed proportional frequency

H02P 23/10 . Controlling by adding a dc current (dc current braking H02P 3/24)

H02P 23/12 . Observer control, e.g. using Luenberger observers or Kalman filters

H02P 23/14 . Estimation or adaptation of motor parameters, e.g. rotor time constant, flux, speed, current or voltage

H02P 25/00 **Arrangements or methods for the control of AC motors characterised by the kind of AC motor or by structural details** (starting H02P 1/00; stopping or slowing H02P 3/00; of two or more motors H02P 5/00; of synchronous motors with electronic commutators H02P 6/00; of DC motors H02P 7/00; of stepping motors H02P 8/00)

NOTE

When classifying in this group, it is desirable to also classify in groups H02P 21/00, H02P 23/00 or H02P 27/00 if the control method or the kind of supply voltage are of interest.

H02P 25/02 . characterised by the kind of motor
H02P 25/021 . . { Synchronous motors }
H02P 25/022 . . . { controlled by supply frequency }
H02P 25/023 . . . . { thereby detecting the rotor position }
H02P 25/025 . . . { Four quadrant control }
H02P 25/026 . . . { with brushless excitation }
H02P 25/027 . . { Control of reciprocating, oscillating or vibrating motors (Note: see also H01F) }
H02P 25/028 . . { Control of voice coil motors (Note: see also H01F) }
H02P 25/04 . . Single phase motors, e.g. capacitor motors
H02P 25/06 . . Linear motors
H02P 25/08 . . Reluctance motors
H02P 25/081 . . . { Modifications for increasing the switching speed from one coil to the next one }
H02P 25/082 . . . { Commutation }
H02P 25/083 . . . . { Sensorless control, see also direct torque control H02P 23/004 }
H02P 25/085 . . . { Converters specially adapted for controlling reluctance motors }
H02P 25/086 . . . . { wherein the converter comprises only one switch per phase }
H02P 25/087 . . . { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }
H02P 25/088 . . . { Arrangements for reducing torque ripple }
H02P 25/10 . . Commutator motors, e.g. repulsion motors
H02P 25/102 . . . { Repulsion motors }
H02P 25/105 . . . { Four quadrant control }
H02P 25/107 . . . { Polyphase or monophase commutator motors }
H02P 25/12 . . . with shiftable brushes
H02P 25/14 . . . Universal motors (H02P 25/12 takes precedence)
H02P 25/145 . . . . whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value, speed feedback

H02P 25/16 . characterised by the circuit arrangement or by the kind of wiring

H02P 25/18 . . with arrangements for switching the windings, e.g. with mechanical switches or relays

H02P 25/182 . . . { whereby the speed is regulated by using centrifucal devices, e.g. switch, resistor }

H02P 25/184 . . . { wherein the motor speed is changed by switching from a delta to a star, e.g. wye, connection of its windings, or vice versa. }

H02P 25/186 . . . { whereby the speed is regulated by using a periodic interrupter (H02P 5/30 takes precedence) }

H02P 25/188 . . . { wherein the motor windings are switched from series to parallel or vice-versa to control speed or torque }

H02P 25/20 . . . for pole-changing

H02P 25/22 . . Multiple windings; Windings for more than three phases

H02P 25/24 . . Variable impedance in stator or rotor circuit

H02P 25/26 . . . with arrangements for controlling secondary impedance

H02P 25/28 . . using magnetic devices with controllable degree of saturation, e.g. transductors

H02P 25/30 . . the motor being controlled by a control effected upon an ac generator supplying it

H02P 25/32 . . using discharge tubes

H02P 25/325 . . . { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 27/00 **Arrangements or methods for the control of AC motors characterised by the kind of supply voltage** (starting H02P 1/00; stopping or slowing H02P 3/00; of two or more motors H02P 5/00; of synchronous motors with electronic commutators H02P 6/00; of DC motors H02P 7/00; of stepping motors H02P 8/00)

NOTE

When classifying in this group, it is desirable to also classify in groups H02P 21/00, H02P 23/00 or H02P 25/00 if the control method, the kind of AC motor or structural details are of interest.

H02P 27/02 . using supply voltage with constant frequency and variable amplitude

H02P 27/023 . . { wherein only rotor or only stator circuit is supplied with ac }

H02P 27/026 . . { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 27/04 . using variable-frequency supply voltage, e.g. inverter or converter supply voltage

H02P 27/042 . . { wherein only rotor or only stator circuit is supplied with ac }

H02P 27/045 . . { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 27/047 . . { V/F converter, wherein the voltage is controlled proportionally with the frequency }

H02P 27/05 . . using ac supply for both rotor and stator circuits, the frequency of supply to at least one circuit being variable { (see also H02P 6/005 or H02P 9/007, doubly fed motors or generators respectively) }

H02P 27/06 . . using dc to ac converters or inverters (H02P 27/05 takes precedence)

H02P 27/08 . . . with pulse width modulation

H02P 27/085 . . . . { wherein the PWM mode is adapted on the running conditions of the motor, e.g. the switching frequency }

H02P 27/10 . . . . using bang-bang controllers

H02P 27/12 . . . . pulsing by guiding the flux-, current-, or voltage-vector on a circle or a closed curve, e.g. direct torque control { (direct torque control per se, H02P 23/004) }

H02P 27/14 . . . . with three or more levels of voltage

H02P 27/16 . . using ac to ac converters without intermediate conversion to dc (H02P 27/05 takes precedence)

H02P 27/18 . . . varying the frequency by omitting half waves

H02P 29/00 **Arrangements for regulating or controlling electric motors, appropriate for both ac- and DC motors** (starting H02P 1/00; stopping or slowing H02P 3/00; control of motors that can be connected to two or more different voltage or current supplies H02P 4/00; vector control H02P 21/00)

H02P 29/0005 . { for preventing over- or under speed }

H02P 29/0011 . { for controlling one motor used for different sequential operations }

H02P 29/0016 . { Control of angular speed of one shaft without controlling the prime mover }

H02P 29/0022 . . { Controlling a brake between the prime mover and the load }

H02P 29/0027 . . { Controlling a clutch between the prime mover and the load }

H02P 29/0033 . { Controlling the mechanical load according to the amount of current drawn or delivered by the motor }

H02P 29/0038 . { Reduction of harmonics }

H02P 29/0044 . { Controlling or determining the motor or drive temperature (AC motor parameter estimation H02P 23/14; motor parameter estimation for vector control H02P 21/14; protection against overload H02P 29/02; protection against faults of stepper motores H02P 8/36) }

H02P 29/005 . . { for raising the temperature of the motor }

H02P 29/0055 . . { controlling or determining the winding temperature (H02P 29/0072 takes precedence) }

H02P 29/0061 . . { controlling or determining the rotor temperature }

H02P 29/0066 . . . { the rotor having permanent magnets (H02P 29/0083 takes precedence) }

H02P 29/0072 . . . { the rotor having windings }

H02P 29/0077 . . . . { by rotor current detection }

H02P 29/0083 . . { by back-emf evaluation to obtain the motor temperature (back-emf based rotor position determination H02P 6/182) }

H02P 29/0088 . . { based on the temperature of a drive component or a semiconductor component }

H02P 29/0094 . . . { compensating for Hall sensor temperature non-linearity }

H02P 29/02 . Providing protection against overload without automatic interruption of supply, e.g. monitoring { (protection during start H02P 1/022; protection for stepper motors H02P 8/36; generator overload and transient protection H02P 9/10; protection with automatic interruption H02H 7/0833) }

NOTE

Informative note
References listed below indicate places which could also be of interest when carrying out a search in respect of the subject matter covered by the preceding group:
Emergency protective circuit arrangements with automatic interruption if supply, in general H02H 7/08;
Emergency protective circuit arrangements for limiting excess current or voltage without disconnection in general H02H 7/08

H02P 29/021 . . { Detecting a fault condition, e.g. short circuit, locked rotor, open circuit or loss of load }

H02P 29/022 . . . { the motor continuing operation despite a fault condition, e.g. eliminating, compensating or remediating for the fault }

H02P 29/023 . . . { the fault being a broken phase }

H02P 29/024 . . . { the fault being an overvoltage }

H02P 29/025 . . . { the fault being a power interruption }

H02P 29/026 . . . { the fault being a power fluctuations }

H02P 29/027 . . . { the fault being an over-current }

H02P 29/028 . . { Preventing damage to the motor, e.g. setting individual current limits for different drive conditions }

H02P 29/04 . by means of a separate brake

H02P 29/045 . . { whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value }

H02P 31/00 **Arrangements for regulating or controlling electric motors not provided for in groups H02P 1/00 to H02P 5/00, H02P 7/00 or H02P 21/00 to H02P 29/00**

H02P 2005/00 **Arrangements specially adapted for regulating or controlling the speed or torque of two or more electric motors** (starting H02P 1/00; stopping or slowing H02P 3/00; { synchronous motors or other dynamo-electric motors with electronic commutators in dependence on the rotor position H02P 6/00; motors rotating step by step H02P 8/00; } vector control H02P 21/00)

H02P 2005/001 . Control of angular speed of one shaft by controlling the prime mover

H02P 2005/002 . Control of angular speed together with angular position or phase

H02P 2005/004 . . of one shaft without controlling the prime mover

H02P 2005/005 . . of one shaft by controlling the prime mover

H02P 2005/007 . Control of acceleration or deceleration

H02P 2005/008 . Digital speed control using a reference oscillator, a speed proportional pulse rate feedback and a digital comparator

H02P 2005/04 . for speed regulation of an individual motor by means of a separate brake

H02P 2005/05 . characterised by the use of reluctance motors

H02P 2005/055 .. Modifications for increasing the switching speed from one coil to the next one

H02P 2005/06 . for speed regulation of an individual dc dynamo-electric motor by varying field or armature current

H02P 2005/08 .. using centrifugal devices, e.g. switch, resistor

H02P 2005/10 .. using a periodic interrupter, e.g. Tirrill regulator

H02P 2005/12 .. using discharge tubes or semiconductor devices

H02P 2005/14 ... using discharge tubes

H02P 2005/16 ... using semiconductor devices

H02P 2005/1603 .... the DC-motor is operated in the four quadrants

H02P 2005/1606 ..... controlling armature and field supply

H02P 2005/1609 ..... controlling field supply only

H02P 2005/1613 ..... controlling armature supply only

H02P 2005/1616 ..... using AC-DC or DC-AC-DC converters

H02P 2005/162 .... controlling field supply only

H02P 2005/165 .... controlling armature supply only

H02P 2005/168 ..... using variable impedance

H02P 2005/17 ..... using pulse modulation

H02P 2005/171 ..... with on-off control between two setpoints

H02P 2005/172 ..... using static converters, e.g. ac to dc

H02P 2005/1725 ..... using phase control

H02P 2005/175 ..... of the kind having one thyristor or the like in series with the power supply and the motor

H02P 2005/178 .... controlling armature and field supply

H02P 2005/18 .. using magnetic devices with controllable degree of saturation, i.e. transductors

H02P 2005/20 .. using armature-reaction-excited machines, e.g. metadyne, amplidyne, rototrol

H02P 2005/22 .. using Ward-Leonard set

H02P 2005/24 ... in which only the generator field is controlled

H02P 2005/26 ... in which both generator and motor fields are controlled

H02P 2005/28 . for speed regulation of an individual ac motor by varying stator or rotor current

H02P 2005/30 .. using centrifugal devices, e.g. switch, resistor

H02P 2005/32 .. using a periodic interrupter

H02P 2005/34 .. by varying frequency of supply to rotor or stator

H02P 2005/36 .. using discharge tubes or semiconductor devices

H02P 2005/38 ... using discharge tubes

H02P 2005/40 ... using semiconductor devices

H02P 2005/4001 .... the AC-motor being operated in the four quadrants

H02P 2005/4002 ..... Polyphase or monophase asynchronous induction motors

H02P 2005/4003 ..... controlled by variable supply frequency

H02P 2005/4005 ..... controlled by variable supply voltage

H02P 2005/4006 ..... controlled by controlling the exchange of slip-energy between the motor and the power supply

H02P 2005/4007 ..... Synchronous motors

H02P 2005/4008 . . . . . Polyphase or monophase commutator motors
H02P 2005/401 . . . . Synchronous motors
H02P 2005/4011 . . . . . controlled by supply frequency
H02P 2005/4012 . . . . . thereby detecting the rotor position
H02P 2005/4013 . . . . . with brushless excitation
H02P 2005/4015 . . . . by methods not covered by groups H02P 2005/4016 to H02P 2005/415
H02P 2005/4016 . . . . controlled according to a desired slip setting
H02P 2005/4017 . . . . controlled by superposition of DC-current upon the AC supply
H02P 2005/4018 . . . . controlled by the switch frequency of the switches connected a DC supply and the motorphases
H02P 2005/402 . . . . controlling supply voltage
H02P 2005/405 . . . . controlling secondary impedance
H02P 2005/408 . . . . controlling supply frequency
H02P 2005/4083 . . . . . thereby changing the voltage according to the frequency
H02P 2005/4086 . . . . . thereby changing the current according to the frequency
H02P 2005/41 . . . . . using dc to ac converters
H02P 2005/412 . . . . . using ac to ac converters without intermediate conversion to dc
H02P 2005/415 . . . . controlling slip energy
H02P 2005/418 . . . . for regulating commutator motors
H02P 2005/4183 . . . . . Series motors; Universal motors
H02P 2005/4186 . . . . . Repulsion motors
H02P 2005/42 . . using magnetic devices with controllable degree of saturation, i.e. transductors
H02P 2005/44 . . using brush shifting arrangements

H02P 2006/00 **Arrangements for controlling synchronous motors or other dynamo-electric motors with electronic commutators in dependence on the rotor position; Electronic commutators therefor** (stepping motors H02P 8/00; vector control H02P 21/00; reluctance motors H02P 25/08)

NOTE

Groups H02P 6/006 and H02P 6/008 take precedence over groups H02P 6/001 to H02P 6/005 and H02P 6/04 to H02P 6/24

H02P 2006/04 . Arrangements for controlling or regulating speed or torque of more than one motor
H02P 2006/045 . . Control of current

H02P 2007/00 **Arrangements for regulating or controlling the speed or torque of electric DC motors** (starting H02P 1/00; stopping or slowing H02P 3/00; { synchronous motors or other dynamo-electric motors with electronic commutators in dependence on the rotor position H02P 6/00; motors rotating step by step H02P 8/00; } vector control H02P 21/00)

H02P 2007/0005 . for preventing over- or under speed

H02P 2007/0011 . for controlling one motor used for different sequential operations

H02P 2007/0016 . Control of angular speed of one shaft without controlling the prime mover
H02P 2007/0022 . . Controlling a brake between the prime mover and the load
H02P 2007/0027 . . Controlling a clutch between the prime mover and the load

H02P 2007/0033 . Controlling the mechanical load according to the amount of current drawn or delivered by the motor

H02P 2007/0038 . { Controlling the direction of rotation of DC motors }
H02P 2007/005 . . of DC motors only
H02P 2007/0055 . . . by means of a H-bridge circuit
H02P 2007/0061 . . . by means of electronic switching
H02P 2007/0072 . . of AC motors only

H02P 2007/0077 . Control of reciprocating, oscillating or vibrating motors

H02P 2007/0083 . Control of voice coil motors

H02P 2007/0088 . Microprocessor-controlled motors

H02P 2007/01 . adapted to be connected to two or more voltage or current supplies

H02P 2007/04 . for controlling an individual motor by means of a separate brake

H02P 2007/05 . characterised by the use of reluctance motors
H02P 2007/052 . . Arrangements for reducing torque ripple
H02P 2007/054 . . Commutation
H02P 2007/056 . . . Sensorless control
H02P 2007/058 . . Converters specially adapted for controlling reluctance motors

H02P 2007/06 . for regulating or controlling an individual dc dynamo-electric motor by varying field or armature current
H02P 2007/18 . . by master control with auxiliary power

H02P 2007/36 . for controlling an individual ac dynamo-electric motor by varying stator or rotor current
H02P 2007/38 . . by manual control without auxiliary power
H02P 2007/40 . . . using variable impedance in stator or rotor circuit
H02P 2007/42 . . . using variable-frequency supply
H02P 2007/44 . . . . wherein only rotor or only stator circuit is supplied with ac
H02P 2007/46 . . . . wherein both rotor and stator circuits are supplied with ac, the frequency of supply to one circuit being variable
H02P 2007/48 . . . by pole-changing
H02P 2007/50 . . . by shifting the brushes of a commutator motor
H02P 2007/52 . . by master control with auxiliary power
H02P 2007/54 . . . using multi-position switch, e.g. drum, controlling motor circuit by means of relays

H02P 2007/56 . . . using multi-position switch, e.g. drum, controlling motor circuit by means of pilot-motor-operated multi-position switch or pilot-motor- operated variable resistance

H02P 2007/58 . . . using discharge tubes or semiconductor devices

H02P 2007/60 . . . . using discharge tubes

H02P 2007/62 . . . . using semiconductor devices

H02P 2007/6202 . . . . . the AC-motor being operated in the four quadrants

H02P 2007/6204 . . . . . Synchronous motors

H02P 2007/6206 . . . . . controlled by supply frequency

H02P 2007/6208 . . . . . thereby detecting the rotor position

H02P 2007/6211 . . . . . by methods not covered by H02P 2007/6213 to H02P 2007/635

H02P 2007/6213 . . . . . controlled according to a desired slip-setting

H02P 2007/6215 . . . . . controlled by superposition of DC-current upon the AC-supply

H02P 2007/6217 . . . . . controlled by the switch frequency of the switches connected between a DC-supply and the motorphases

H02P 2007/622 . . . . . controlling supply voltage

H02P 2007/6223 . . . . . power factor control

H02P 2007/6226 . . . . . for single-phase motors

H02P 2007/625 . . . . . controlling secondary impedance

H02P 2007/628 . . . . . controlling supply frequency

H02P 2007/6283 . . . . . thereby changing voltage according to frequency

H02P 2007/6286 . . . . . thereby changing current according to frequency

H02P 2007/63 . . . . . using dc to ac converters

H02P 2007/6305 . . . . . with pulse width modulation (PWM)

H02P 2007/631 . . . . . with bang-bang controllers

H02P 2007/6315 . . . . . with three or more levels

H02P 2007/632 . . . . . using ac to ac converters without intermediate conversion to dc

H02P 2007/6325 . . . . . varying the frequency by omitting half waves

H02P 2007/635 . . . . . controlling slip energy

H02P 2007/638 . . . . . for controlling commutator motors

H02P 2007/6383 . . . . . Series motors; Universal motors

H02P 2007/6386 . . . . . Repulsion motors

H02P 2007/64 . . . using magnetic devices with controllable degree of saturation, i.e. transductors

H02P 2007/66 . . . using an ac generator to supply the motor, the motor being controlled by a control effected upon the generator

H02P 2007/67 . for controlling two or more dynamo-electric motors

H02P 2007/68 . . for controlling two or more dc dynamo-electric motors

H02P 2007/685 . . . electrically connected in series, i.e. carrying the same current

H02P 2007/69 . . . mechanically coupled by gearing

H02P 2007/695 . . . . Differential gearing

H02P 2007/74 . . for controlling two or more ac dynamo-electric motors

H02P 2007/747 . . . mechanically coupled by gearing

H02P 2007/753 . . . . Differential gearing

H02P 2007/78 . . . for cascade connection between motors, e.g. motors permanently connected in cascade, motors switched from parallel to cascade connection

H02P 2007/80 . . for controlling combinations of dc and ac dynamo-electric motors

H02P 2009/00 **Arrangements for controlling electric generators for the purpose of obtaining a desired output** (Ward-Leonard arrangements H02P 7/34; vector control H02P 21/00; feeding a network by two or more generators H02J ; for charging batteries H02J 7/14)

H02P 2009/001 . Controlling arrangements characterised by their applications

H02P 2009/002 . . Control of generators for motor vehicles e.g. car alternators

H02P 2009/003 . . Control of generators for water driven turbines

H02P 2009/004 . . Control of generators for wind turbines

H02P 2009/005 . . Control of generators for aircrafts

H02P 2021/00 **Arrangements or methods for the control of electric machines by vector control, e.g. by control of field orientation**

NOTE

1. Groups H02P 21/06 to H02P 21/12 cover vector control arrangements or methods involving the use of rotor position or speed sensors.
2. Vector control arrangements or methods not involving the use of rotor position or speed sensors are classified in groups H02P 21/0039 and subgroups

When classifying in this group, it is desirable to also classify in groups 25/00 to 27/00 if the kind of AC motor, structural details, or the kind of supply voltage are of interest.

H02P 2021/0003 . { Control strategies in general, e.g. linear type e.g. P, PI, PID, using robust control }

H02P 2021/0028 . . Direct torque control (DTC); Field acceleration method (FAM)

H02P 2021/0057 . Internal or external parameter adaptation; Modelling

H02P 2021/006 . . Estimation, e.g. observer

H02P 2021/0064 . . . Flux estimation

H02P 2021/0067 . . . Sensorless speed estimation

H02P 2021/0071 . Rotor flux based control

H02P 2021/0075 . . Direct control of flux

H02P 2021/0078 . . Indirect control of flux

H02P 2021/0082 . . . Slip control

H02P 2201/00 **Indexing scheme relating to controlling arrangements characterised by the converter used**

H02P 2201/01 . AC-AC converter stage controlled to provide a defined AC voltage

H02P 2201/03 . AC-DC converter stage controlled to provide a defined DC link voltage (general aspects of plural converters in cascade H02M)

H02P 2201/05 . Capacitive half bridge, i.e. resonant inverter having two capacitors and two switches

H02P 2201/07 . DC-DC step-up or step-down converter inserted between the power supply and the inverter supplying the motor, e.g. to control voltage source fluctuations, to vary the motor speed (general aspects of plural converters in cascade H02M)

H02P 2201/09 . Boost converter, i.e. DC-DC step up converter increasing the voltage between the supply and the inverter driving the motor (general aspects of plural converters in cascade H02M)

H02P 2201/11 . Buck converter, i.e. DC-DC step down converter decreasing the voltage between the supply and the inverter driving the motor (general aspects of plural converters in cascade H02M)

H02P 2201/13 . DC-link of current link type, e.g. typically for thyristor bridges, having an inductor in series with rectifier

H02P 2201/15 . Power factor Correction [PFC] circuit generating the DC link voltage for motor driving inverter (motor power factor control H02P 23/0081)

H02P 2203/00 Indexing scheme relating to controlling arrangements characterised by the means for detecting the position of the rotor

H02P 2203/01 . Motor rotor position determination based on the detected or calculated phase inductance, e.g. for a Switched Reluctance Motor

H02P 2203/03 . Determination of the rotor position, e.g. initial rotor position, during standstill or low speed operation

H02P 2203/05 . Determination of the rotor position by using two different methods and/or motor models

H02P 2203/07 . Motor variable determination based on the ON-resistance of a power switch, i.e. the voltage across the switch is measured during the ON state of the switch and used to determine the current in the motor and to calculate the speed

H02P 2203/09 . Motor speed determination based on the current and/or voltage without using a tachogenerator or a physical encoder

H02P 2203/11 . Determination or estimation of the rotor position or other motor parameters based on the analysis of high frequency signals (position detection of motors with electronic commutators in dependence of the position H02P 6/185)

H02P 2205/00 Indexing scheme relating to controlling arrangements characterised by the control loops

H02P 2205/01 . Current loop, i.e. comparison of the motor current with a current reference

H02P 2205/03 . Power loop, i.e. comparison of the motor power with a power reference

H02P 2205/05 . Torque loop, i.e. comparison of the motor torque with a torque reference

H02P 2205/07 . Speed loop, i.e. comparison of the motor speed with a speed reference

H02P 2207/00 **Indexing scheme relating to controlling arrangements characterised by the type of motor**

H02P 2207/01 . Asynchronous machines

H02P 2207/03 . Double rotor motors or generators, i.e. electromagnetic transmissions having double rotor with motor and generator functions, e.g. for electrical variable transmission

H02P 2207/05 . Synchronous machines, e.g. with permanent magnets or DC excitation

H02P 2207/055 . . Surface mounted magnet motors

H02P 2207/07 . Doubly fed machines receiving two supplies both on the stator only wherein the power supply is fed to different sets of stator windings or to rotor and stator windings

H02P 2207/073 . . wherein only one converter is used, the other windings being supplied without converter e.g. doubly-fed induction machines

H02P 2207/076 . . wherein both supplies are made via converters: especially doubly-fed induction machines; e.g. for starting

H02P 2209/00 **Indexing scheme relating to controlling arrangements characterised by the waveform of the supplied voltage or current**

H02P 2209/01 . Motors with neutral point connected to the power supply

H02P 2209/03 . Motors with neutral point disassociated, i.e. the windings ends are not connected directly to a common point

H02P 2209/05 . Polyphase motors supplied from a single-phase power supply or a DC power supply

H02P 2209/07 . Trapezoidal waveform

H02P 2209/09 . PWM with fixed limited number of pulses per period

H02P 2209/095 . . One pulse per half period

H02P 2209/11 . Sinusoidal waveform

H02P 2209/13 . Different type of waveforms depending on the mode of operation